\VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office

INTRA-AGENCY MEMORANDUM

Permit Writer	Margaret O. Wagner			
Memo To	Air Permit File	**Date**	DRAFT	
Facility Name	INGENCO Renewable Development, LLC			
Registration Number	**21548**			
County-Plant I.D.	155-00068			
UTM Coordinates (Zone 17)	529.0	**Easting (km)**	4116.6	**Northing (km)**
Elevation (feet)	2100			
Distance to Class I Areas	>100	**SNP (km)**	113.1	**JRF (km)**
FLM Notification (Y/N)	N	**Required if less than 10K (minor), 100K (state major)**		
NET Classification (A, SM, B)	A	**Before permit action**	A	**After permit action**
Title V Major Pollutants	NOx, CO	**Before permit action**	NOx, CO	**After permit action**
PSD Major Source (Y/N)	Y	**Before permit action**	N	**After permit action**
PSD Major Pollutants	NO_x, CO	**Before permit action**	NA	**After permit action**

I. Introduction

The INGENCO Renewable Development, LLC, (INGENCO) is an electric power generation facility. INGENCO proposes to construct and operate a landfill gas to energy facility located at the New River Resource Authority (NRRA) landfill located at 7100 Cloyd's Mountain Road, Dublin, VA. The facility submitted an application dated July 15, 2011. Additional information dated August 14, 2011, December 14, 2011, February 10, 2012, March 30, 2012, June 1, 2012 and July 11, 2012 was received and the application was deemed complete on July 13, 2012. The application information dated July 11, 2012 and received on July 13, 2012 was for a change of ownership.

The INGENCO facility will be located at the same location as the New River Resource Authority (NRRA) landfill that supplies the landfill gas. The proximity of the two facilities requires a review to determine if the two sites should be considered a single stationary source for the various permitting programs. Based on the information submitted, the two facilities do not appear to meet the requirements for a single stationary source under federal Clean Air Act permit programs for prevention of significant deterioration (PSD) and Title V because of the following: under the terms of agreement between NRRA and INGENCO, INGENCO is responsible for all capital improvements on the leased property to create the electricity plant; NRRA and INGENCO have no financial interest in one another in that there is no indication that the companies have common employees or officers, or that they share equipment (including pollution control equipment), payroll activities, employee benefits, health plans or other administrative functions; NRRA and INGENCO do not share intermediates, products, byproducts or manufacturing equipment, or property other than INGENCO leases property from NRRA and will purchase a percentage of its fuel from NRRA; NRRA currently receives its power through a local power utility and there is no indication that it will receive power directly from INGENCO; and finally, neither facility is

dependent on the other; if either NRRA or INGENCO shuts down, the other facility can continue to operate. This common control decision is based on the Common Control for Maplewood Landfill, also known as Amelia Landfill, and Industrial Power Generating Corporation decision made by the EPA in a letter dated May 1, 2002. Operation of the facilities in the future, in a fashion different from represented in the application, or such that the Maplewood decision is no longer appropriate may result in a change to this determination. As separate sources, INGENCO will have a separate registration number and permit.

II. Emission Unit(s) / Process Description(s)

INGENCO proposes installation of 12 Detroit Diesel 12.7L Series 60 engines manufactured between 1996 and 1998. The engines will be equipped with a proprietary control system (aka PCM128) developed by INGENCO to optimize operations and emissions at high gas fractions. The engines are mated to 350 kW generators. All engines parts are standard, off-the-shelf, Detroit Diesel parts. Switch gear and external controls are designed, constructed and programmed by INGENCO. The twelve engines will be installed in two groups of six engines. Each group has a group control system, group header and exhaust and cooling. Each of the engines in a group can be operated under different conditions.

The engines will be fueled by No. 2 fuel oil, biodiesel and landfill gas. The fuel oil will be sourced from local fuel suppliers and have a maximum sulfur content of 15 ppm (0.0015%). Landfill gas will be supplied by the NRRA landfill.

The application states that the engines can operate in single-fuel mode, burning only liquid fuel and in dual fuel mode burning liquid fuel and landfill gas. The amount of landfill gas substituted for liquid fuel (gas fraction) will depend on the availability of landfill gas and the demands for power output. The facility plans to operate at 0% gas fraction during startup and during periods of high electrical demand and no supply of landfill gas. The facility expects the majority of the operations to be in the range of 88% to 98% on an annual average[1] (generally 92% to <98%) gas fraction, which maximizes the use of landfill gas and produces the lowest emission rates at the facility. The facility may also operate for short periods of time in "mixed modes" where the majority of the engines are operating at high gas fraction and the remainder are operating on 100% oil.
The application also included a 0.133 MMBtu/hour oil fired boiler that is used for freeze protection for the engines when the plant does not operate in cold weather, and various tanks used for fuel storage to support the facility.

III. Regulatory Review

A. 9 VAC 5 Chapter 80, Part II, Article 6 – Minor New Source Review

The proposed project is construction of a stationary source at a greenfield site. For a project to be exempt from permitting, the regulations provide that a project must be exempt from both 9 VAC 5-80-1320 B through D as a group and either 9 VAC 5-80-1320 E or F.

[1] The EPA's definition of "spark ignition" in Subpart ZZZZ (63.6675) indicates an engine is a compression ignition engine if the engine uses at least two parts of diesel fuel per 100 parts total fuel on an annual average. INGENCO avoids classification as spark ignited engines by limiting fuel and maintaining fuel consumption at ≤98% on an annual average.

The facility proposes construction of several storage tanks to support engine operation (4 total) storing distillate fuel. These storage tanks are exempt from permitting under 9 VAC 5-80-1320 B as the largest tank is 12,000 gallons (9VAC5-80-1320B.4). This size tank is not subject to the requirements of 40 CFR 60 Subpart Kb (75 m^3 threshold).

The project is a new stationary source with no other emission units listed in 9 VAC 5-80-1320 B; therefore, the exemption determination turns to 9 VAC 5-80-1320 C for the remainder of the source. The potential to emit (PTE) for this greenfield source is considered the sum of the uncontrolled emission rates (UERs) for each emission unit not exempted under 9 VAC 5-80-1320 B.

As shown in the summary table below, the PTE for CO, NO_x, PM10 and VOCs exceeds the respective permitting threshold; therefore, the project is subject to the permitting requirements of Article 6. See Attachment 2 of the application dated July 15, 2011 for all calculations.

Table 1: Uncontrolled Emissions for Permit Applicability from facility

Pollutant	PTE tons/year	Permitting Exempt Emission Rate (tons/year)	Permitting Applicable
Carbon Monoxide	339.4	100	Yes
Nitrogen Oxides	410.4	40	Yes
Sulfur Dioxide	5.5	40	No
PM10	57.9	15	Yes
VOCs	77.3	25	Yes

As described in Section III.E, the facility includes equipment that is in a source category subject to a standard promulgated pursuant to 40 CFR 63 (Subpart ZZZZ, Subpart JJJJJJ). Therefore, the project is exempt from the state toxics rule (9 VAC 5-60 Article 5).[2]

The facility is a state major source[3] with a potential to emit (PTE) of CO and NOx greater than 100 tons per year. As a new state major source, the project must meet the following additional requirements:

- Publication by the source of a notice of application
- A 30-day public comment period with a public hearing and comments must be accepted for 15 days following the hearing (minimum 45 total public comment days)
- Localities particularly affected must be notified
- Federal Land Manager (FLM) notification is not required per the memorandum of understanding due to the proximity to each Class I area (>100 km)

These requirements are further discussed in Section X of this document.

[2] Toxic emissions from the fuel storage tanks are expected to be neglible due to the low tank throughput and low vapor pressure of distillate.

[3] The term "major source" is the defined term; however, several different definitions of major source may apply at a given facility (e.g., Article 6, Article 8, Title V, HAP). In clarifying which definition of major source applies, "state major" is the common terminology to indicate the source is major under the definition contained in 9VAC5-80 Article 6, minor new source review.

Additional discussion of permitting requirements can be found in Section IV.

B. 9 VAC 5 Chapter 80, Part II, Article 8 and Article 9 – PSD Major New Source Review and Non-Attainment Major New Source Review

Pulaski County is a PSD area for all pollutants as designated in 9 VAC 5-20-205. After issuance of this permit, the facility does not have the PTE of any NSR-regulated pollutant at major stationary source thresholds. PSD review does not apply.

Greenhouse Gases (9 VAC 5 Chapters 80 and 85)

Beginning on July 1, 2011, greenhouse gases (GHG) is a pollutant that must be considered for regulation as a "regulated NSR pollutant". GHG is subject to regulation under the PSD program if the new stationary source has a potential to emit (PTE) of 100,000 tons of CO_2 equivalents[4] (CO_2e) per year. Based on the 40 CFR Part 98 highest factor for an approved fuel (73.96 kg CO_2/MMBtu, 0.0030 kg CH_4/MMBtu, 0.00060 kg N_2O/MMBtu), the respective global warming potential, and the total facility heat input (rounded to 44 MMBtu/hr), the facility does not have a PTE greater than 100,000 TPY CO_2e; therefore, GHG is not subject to regulation for the project.

C. 9 VAC 5 Chapter 50, Part II, Article 5 – NSPS

Several NSPSs are applicable to engines or tanks. Each is discussed below:

40 CFR Part 60, Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels – is not applicable to the proposed project as the tanks are less than the 75 m^3 threshold.

40 CFR Part 60, Subpart IIII – Standards of Performance for Stationary Compressions Ignition Internal Combustion Engines – applies to engines constructed after April 1, 2006. The proposed project is not subject to the NSPS requirements due to the age of the engines to be installed (manufactured dates 1995-1998).

40 CFR Part 60, Subpart JJJJ - Standards of Performance for Stationary Compressions Ignition Internal Combustion Engines –is not applicable to the proposed project as the engines are compression ignition and not spark ignition engines.

D. 9 VAC 5 Chapter 60, Part II, Article 1 – NESHAPS

No 40 CFR Part 61 standards apply.

E. 9 VAC 5 Chapter 60, Part II, Article 2 – MACT

INGENCO is an area source for individual and combined HAPs. The facility is subject to the following Area Source MACTs.

40 CFR Part 63, Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines is applicable to the proposed project but is limited to maintenance procedures and operations to minimize emissions.

[4] CO_2e is the emission rate of each GHG species multiplied by its respective global warming potential (GWP) from 40 CFR Part 98.

40 CFR Part 63, Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial and Institutional Boilers and Process Heaters is applicable to the 0.25 MMBtu/hr oil fired boiler but is limited to tune-ups to minimize emissions.

F. State Only Enforceable (SOE) Requirements (9 VAC 5-80-1120 F)
None.

IV. Best Available Control Technology Review (BACT)

BACT applicability for greenfield facilities is based on the permitting applicability thresholds. Units that are part of a new greenfield facility emitting a pollutant above the thresholds in 9 VAC 5-80-1320 C shall apply BACT for that pollutant (9 VAC 5-50-260 B). The stationary source is subject to BACT for NOx, CO, VOC, and PM10.

The INGENCO facility proposed BACT being the same as other dual fuel LFG gas to energy plants using Detroit Diesel series 60 engines. The application dated July 15, 2011 includes a BACT technology review in Attachment 4. The review addresses each of the criteria pollutants listed above.

INGENCO addresses catalytic post treatment for engines in their BACT review. Emission reductions using oxidative and reductive catalysts are common for spark ignition and compression ignition engines. However, catalysts are very susceptible to poisoning by silicon compounds. Landfill gas contains a number of organosilicon compounds such as siloxanes, silanes, and silicones. The facility presents the EPA's assessment on post treatment from engines. As stated in a Memorandum "Response to Public Comments on Proposed Standards of Performance for Stationary Spark Ignition Internal Combustion Engines and National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines" (2007), the EPA indicated that emission reductions for landfill gas would not be based on catalytic post treatment due to the presence of siloxanes in the gas.

INGENCO addresses criteria pollutants that will be subject to BACT at the Dublin facility as outlined below:

NOx - According to the RACT/BACT/LAER Clearinghouse data, NOx reduction technologies are limited to:

Lean burn technology
Good combustion or good combustion practices
Turbochargers for compression ignition engines
Charge air cooling to reduce the combustion temperature
Air/fuel ratio control
Fuel substitution

The engines planned for the INGENCO facility will include turbochargers and aftercoolers to maintain inlet charge at no more than 140°F temperature. The facility also plans to manage combustion practices and air-fuel ratio.

As catalyst treatment is not a consideration due to siloxanes, CO controls are maintenance and good combustion practices. BACT for CO control at INGENCO will include good combustion practices in the form of a proprietary engine control module designed to minimize CO emissions. The facility plans to operate with the maximum ratio of landfill gas to total energy, which will result in minimizing dual fuel CO emissions.

As post treatment is not a consideration due to siloxanes, VOC controls are maintenance and good combustion practices. Landfill gas will be compressed by blowers that direct the gas to a 10 micron coalescing filter. Dewatering will also be done in this filter. VOCs are also controlled by proprietary controller which maintains good combustion practices. Therefore, BACT for VOC control at the INGENCO facility includes dewatering using a 10 micron coalescing filter and good combustion practices.

PM10 is created from sulfur combustion and incomplete combustion of fuels in the engine chambers. PM10 from fuel oil combustion can be reduced by reducing the sulfur content in the fuel oil burned. PM10 from incomplete combustion is controlled on non-stationery engines by diesel particulate filters. INGENCO addresses BACT for PM10 stating that the landfill gas will be treated by filtration, compression and dewatering. Landfill gas entering the INGENCO facility is filtered through a 10 micron filter. Additional filtration includes engine air filters. PM10 created from fuel oil combustion will be reduced by using ultra low sulfur fuel oil (0.0015%). In addition, BACT for PM10 will include: combustion control using a proprietary engine control module and proper maintenance and operation.

Using these controls, the following per engine emission rates are considered BACT when each engine is in Mode 2 operation[5]:

NOx = 2.5 lb/hr per engine.
CO = 3.0 lb/hr per engine.
PM10 = 1.1 lb/hr per engine.
VOC = 1.5 lb/hr per engine.

Using these controls, the following per engine emission rates are considered BACT when each engine is in Mode 1 operation.

NOx = 7.2 lb/hr per engine.
CO = 3.9 lb/hr per engine.
PM10 = 1.1 lb/hr per engine.
VOC = 1.5 lb/hr per engine.

Due to the stack configuration (6 engines per stack and any combination of operation), Condition 14 of the permit establishes an equation for calculating short term emission limits that reflect BACT.

[5] The lb/hr emission rates listed in this BACT section of the engineering analysis are based on a table submitted in a permit amendment application request from INGENCO dated December 14, 2011. The table is part of the submittal and titled Table 1. Estimated Hourly Emissions. The Table is based on modeling conducted at the INGENCO facility. Mode 1 operation for the purpose of this permit is the intermittent operation of an engine that does not reflect the modeled scenario. See Section VIII for additional discussion.

The equation addresses two operating scenarios and also implements INGENCO modeling results. Using the equation from Condition 14 of the permit, each stack's maximum emission rate is:

Using these controls, the following maximum emission rate per stack is considered BACT when each engine is in Mode 2 operation:

NOx = 15 lb/hr per stack.
CO = 18 lb/hr per stack.
PM10 = 6.6 lb/hr per stack.
VOC = 9.0 lb/hr per stack.

Using these controls, the following maximum emission rate per stack is considered BACT when each engine is in Mode 1 operation.

NOx = 43.2 lb/hr per stack.
CO = 23.4 lb/hr per stack.
PM10 = 6.6 lb/hr per stack.
VOC = 9.0 lb/hr per stack.

V. Summary of Actual Emissions Increase

The facility's increase in PTE is shown in the table below.

Pollutant	Past PTE (TPY)	Future PTE (TPY)	PTE Change (TPY)
CO	0	160.4	160.4
NOx	0	146.0	146.0
SO_2	0	4.1	4.1
PM	0	57.8	57.8
PM10	0	57.8	57.8
VOCs	0	78.8	78.8

VI. Dispersion Modeling

A. Criteria Pollutants

A dispersion modeling analysis was requested by DEQ in letter dated September 15, 2011. The analysis addressed impacts for all pollutants required to be modeled – NO_2, PM_{10}, $PM_{2.5}$ and CO. DEQ's Office of Air Quality Assessments (OAQA) did an analysis of the modeling data submitted by INGENCO. The analysis results are presented below and were outlined in a Memo from OAQA dated February 7, 2012.

The air quality modeling methodology was consistent with the requirements in 40 CFR Part 51, Appendix W (Guideline on Air Quality Models). The air quality model used was the most recent version of the AERMOD modeling system at the time of the approved protocol including:

- AERMET – Version 11059
- AERMAP – Version 11103

- AERMOD – Version 11353

The AERMOD modeling system is considered the "preferred model" by EPA as described in 40 CFR Part 51, Appendix W.

Additional details of the modeling analysis can be found in the following document submitted by the applicant:

Dispersion Modeling Analysis, Industrial Power Generating Company, LLC, New River Resource Authority Landfill, Pulaski County, Dublin, Virginia, January 12, 2012.

The National Ambient Air Quality Standards (NAAQS) compliance demonstration included emissions from the facility and ambient background concentrations. The table below shows the results of modeling:

Pollutant ID	Modeled Impact ($\mu g/m_3$)	Background ($\mu g/m_3$)	Total Concentration Impact + Background ($\mu g/m_3$)	Threshold ($\mu g/m_3$)	Threshold Basis	Averaging Period	Less Than Threshold?
NO_2	112.86	71	183.86	188	NAAQS	1-hour	Yes
	1.78	15	16.78	100	NAAQS	Annual	Yes
PM10	25.45	33	58.45	150	NAAQS	24-hour	Yes
$PM_{2.5}$	7.94	24	31.94	35	NAAQS	24-hour	Yes
	1.08	10.4	11.48	15	NAAQS	Annual	Yes
CO	1405.44	NA	NA	2000	SIL	1-hour	Yes
	402.37	NA	NA	500	SIL	8-hour	Yes

All modeling results demonstrate compliance with the applicable NAAQS.

B. Toxic Pollutants

Modeling is not required for a project that is exempt from the state toxics rule.

VII. Boilerplate Deviations

The permit was drafted using agency approved procedures for the Generic NSR boilerplate and the Skeleton NSR boilerplate. Additional wording was added to the stack testing requirement conditions of the permit. The facility has several operating scenarios that could occur and to capture an effective test that demonstrates compliance with the BACT limits, consideration was given to changes in the stack testing conditions. In addition, language was added to the stack testing requirements to address landfill gas production. Current projection for the facility indicates that 6 to 7 engines can operate on landfill gas in the 2012-2013 timeframe. The landfill is expected to produce enough landfill gas to supply 12 engines by 2022. The facility plans to install 12 engines with this project but not all can be tested on landfill gas at one time.

VIII. Compliance Demonstration

INGENCO will be required to perform initial performance tests on the engines to demonstrate compliance with the emission limits proposed in the permit for dual fuel and distillate fuel and

biodiesel fuel only operation. The tests will require the engines to be tested for pollutants concurrently. In addition, a visible emission evaluation (VEE) is required to be conducted concurrently with the performance test. Testing requirements will be repeated every 5 years as the facility plans to replace the engines routinely when they become inoperable. In addition, INGENCO will be required to maintain records to ensure compliance with fuel certification requirements and emission limits for the engines.

Condition 5 of the draft permit requires that INGENCO continuously measure and record the liquid fuel combusted in each engine. Fuel flow at the facility is calculated by the control system using injector open time and a calibration curve. Both of these can be verified by inspectors. Monitoring of the distillate limit would be accomplished by using the current injector timing calculation (minute by minute monitoring) to totalize fuel for each hour. This would provide the monitoring necessary to demonstrate compliance with Mode 1 operations outlined in Condition 10.

Condition 10 pertains to operating hour limitations for the facility that would be sufficient to meet modeling regulatory requirements. The Regulations preclude DEQ from issuing a permit that does not demonstrate compliance with the National Ambient Air Quality Standard or NAAQS. The INGENCO – New River Resource Authority facility has modeled the emissions of NO_2 to verify that the proposed facility does not cause or exacerbate a violation of the NAAQS. The NAAQS pertinent to the facility is the one-hour standard; therefore, the permit must be drafted to ensure compliance with the one-hour standard. The permit must also address the potential, or theoretical maximum emissions when permitting this facility.

In the modeling report specified in section VI.A. above, operations of the facility were represented as not exceeding 30.17 lbs/hr. Based on the spreadsheet titled Table 1. Estimated Hourly Emissions in the application dated December 14, 2011, DEQ believes that a diesel fuel limitation can properly represent the two "per engine" operating scenarios (i.e., at or less than the modeled value per engine and greater than the modeled value per engine).

In determining this distillate fuel limitation, Condition 10 seeks to define Mode 1 operations which are intermittent plant operations limited to 500 hours per year. Condition 10.a. addresses Mode 1 with start up operations as when more than 2.8 gallons of distillate fuel is combusted in any one hour. Condition 10.b. is to address Mode 1 as all other engine operations in which more than 2.2 gallons of distillate are combusted in one hour. Mode 2 operations are defined as any other plant operation not defined in Condition 10.a. or 10.b. Attachment B shows the calculations used to determine the hourly consumption limitation.

Operation of an engine for a one-hour period that is not limited to 1/12 of the modeled value (i.e., 30.17 equally attributed to each engine) is considered one of the 500 hours allowed for intermittent operation. This condition matches the modeled scenario even though there may be hours counted where the total facility emission limit for a given operation would apparently be less than the modeled value. This could occur where only one engine is operating but that engine's limit is commensurate with the modeled scenario.

IX. Title V Review – 9 VAC 5 Chapter 80 Part II Article 1

The facility is a Title V major source due to a potential to emit (PTE) greater than 100 tons per year

for both NOx and CO. A complete application for a Title V permit is due no later than 12 months after beginning operation.

X. Other Considerations

As this is a greenfield facility, a Local Governing Body Certification form is required. The office received a completed form dated July 20, 2011 stating that the facility is in compliance with all applicable local ordinances. The site suitability analysis was completed on July 31, 2012 and the site is deemed suitable.

As discussed in Section III.A., the project must meet additional requirements, mainly concerned with public participation, due to the new state major source status.

- The permit application fee was received on July 19, 2011.
- The Local Governing Body Certification, required under §10.1-132.1, was signed on July 20, 2011 and received on July 22, 2011.
- Publication by the source of a notice of application was completed on August 24, 2011. The notice was published in *The Southwest Times*.
- The following public participation information was published in *The Southwest Times* on February 10, 2013.
- The public comment period begins on February 10, 2013.
- The public hearing will be held at the Pulaski County Administration Board Room, 143 3rd Street NW, Suite 1 Pulaski, VA on March 13, 2013 at 7:00 p.m.
- The comment period will end on March 27, 2013.
- Localities (Pulaski County) particularly affected were notified by letter dated February 11, 2013.
- EPA, Region III was notified by letter dated February 11, 2013.

XI. Recommendations

Approval of the draft permit is recommended.

Attachments

Attachment A – DEQ's Office of Air Quality Assessments (OAQA) Air Quality Analysis for INGENCO

Attachment B – Mode 1 Operation Calculations